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Development of a Nursery Pen Image Capturing Device to Classify Approachability of Nursery Pigs

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Summary and Implications

The objective of this experiment was to build a mobile structure that could take digital pictures simultaneously with live observation to record pigs' behavior. The digital pen image capturing device specifications (position in pen, height and camera angle) were based on the dimensions of the nursery pens at Lauren Christian Swine Research Center at the Iowa State University Bilsland Memorial Farm, near Madrid, IA where an approachability experiment was to be conducted. The nursery pen dimensions were 1.5 m wide by 2.1 m length and the ceiling height was 2.6 m. The digital pen image capturing device had a steel base that held a 1.6 m tall PVC pipe and at the top of the pipe a PVC T held a tripod head that secured the digital camera. The definition of successfully capturing the nursery pen was a digital image that included four sticky notes that would be positioned in each corner of the pen. Each sticky note measured 7.6 cm length by 7.6 cm width.

Three device positions (left, right and center back), three device heights (1.5 m, 1.8 m, and 2.1 m) and a continuum of tripod head angles (ranging from 0 to 60 degrees) were tested. The final specifications for the digital pen image capturing device was: a height of 1.8 m, a tripod head angle of 35 degrees and a back right corner position.

Introduction

It has been reported that during routine vaccinations, h pigs can display a "buzz" response. A buzz response can be defined as the 6-h period immediately following vaccination, where pigs display marked lethargy. To report this alteration in a pigs' behavior, the authors used a "willingness to approach" (WTA) methodology. The paper reported statistical differences between pre- and post vaccination WTA behavior, however, the authors were challenged over the accuracy of the live methodology. If two methods could be compared directly for WTA behaviors then such concerns could be addressed. Therefore, the objective of this experiment was to build a mobile

structure that could take digital pictures simultaneously with live observation to record pigs' behavior.

Materials and Methods

Definition of success: The definition of successfully capturing the nursery pen was a digital image that included four sticky notes that were positioned in each corner of the pen. Each sticky note measured 7.6 cm length by 7.6 cm width.

Specifications: The digital pen image capturing device specifications (position in pen, height and camera angle) were based on the dimensions of the nursery pens at Lauren Christian Swine Research Center at the Iowa State University (ISU) Bilsland Memorial Farm, near Madrid, IA where an approachability experiment was to be conducted. The nursery pen dimensions were 1.5 m wide by 2.1 m length and the ceiling height was 2.6 m. Therefore, a mock pen was reproduced at the A-Wing at the ISU Veterinary School. The pen dimensions were duct taped out on the floor.

Device: The digital pen image capturing device had a steel base (The Steel Works, Denver, CO) that measured 45.7 cm length x 20.3 cm width x 3.2 mm depth. A 10.2 cm radius cast iron base (LDRI Industries Inc., N. Wikesboro, NC) was welded on top of the steel base; 10.2 cm from the left and 35.6 cm from the right side (to provide an area for the observer to stand on while crouched to add digital pen image capturing device stability). A 2.5 cm wide, 1.6 m tall PVC pipe (Silver-Line Plastics, Asheville, NC) was screwed into the cast iron base. At the top of the PVC pipe a PVC T (Lasco Fittings Inc., Brownsville, TN) was inserted. Inside the first T an additional PVC T was inserted on the right side so the steel rod of the tripod head could be angled at 35 degrees. The camera was held in place by a tripod head that measured 28.6 cm in length and protruded 11.4 cm behind the digital pen image capturing device (Figure 1).

Image collection: The camera was a PENTAX Optio W90 (PENTAX Imaging Company, Golden, CO) and was equipped with an infrared wireless shutter control remote (PENTAX Imaging Company, Golden, CO) attached to the PVC T and a duct tape lanyard measuring 58 cm length ran from the PVC pole and was attached to the remote that was then held in the observer's hand. The camera was angled at 18 degrees and was secured into position onto the digital pen image capturing device using duct tape. The camera focal length was 28 mm, with a resolution of 3 megapixels.

Determination of digital pen image capturing device position within the pen, camera angle and height specifications:

Device position: Position one; right back corner away from the feeder, position two; central midpoint of the back wall away from the feeder and position three; back left corner away from the feeder.

Height of the device: Three heights were compared (1) 1.5 m, (2) 1.8 m, and (3) 2.1 m.

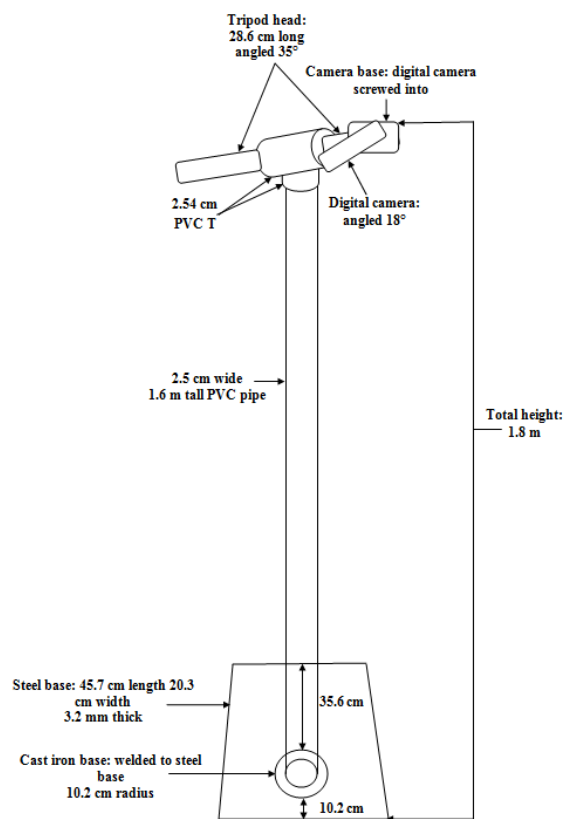
Tripod head angle: The tripod head was placed in PVC T's so the digital camera was vertical once attached. The tripod head was adjusted to angles within the range of 0 to 60 degrees and the digital camera was positioned vertically and adjusted to angles within the range of 0 to 60 degrees.

Height of the device: The goal was to construct a device with the shortest height that captured the entire pen for ease of mobility and no picture distortion (focal length) reasons. This resulted in a final height of 1.8 m.

Tripod head angle: The tripod head holding the camera that was positioned in a horizontal manner from the monopod PVC pipe was sufficient at capturing the entire width of the nursery pen but insufficient at capturing the entire length of the nursery pen. After taking multiple pictures with the tripod head ranging from 0 to 60 degrees, 18 degrees gave a digital picture that allowed all areas of the nursery pen to be captured, without "fish eye" distortion of the nursery pen sides.

Therefore in conclusion, the final specifications for the digital pen image capturing device was: a height of 1.8 m, a tripod head angle of 35 degrees, a camera angle of 18 degrees and a back right corner position that was able to capture this size of nursery pen. Further experiments would need to be conducted to see if this monopod could also capture larger size pens.

Figure 1. Digital pen image capturing device.



Results and Discussion

Device position: The device was placed in the back right corner of the pen (as opposed to the middle or left corner) because the cast iron base was welded to the steel base with more base protruding right so the observer could use their foot for added device stability.